UCL Université catholique de Louvain

LPHY1352

2016-2017

Physics of fluids

5.0 credits	45.0 h + 22.5 h	1q

Teacher(s) :	Deleersnijder Eric ; Legat Vincent ;
Language :	Français
Place of the course	Louvain-la-Neuve
Prerequisites :	LPHY1251, LMAT1261, LPHY1211 *The prerequisite(s) for this Teaching Unit (Unité d'enseignement – UE) for the programmes/courses that offer this Teaching Unit are specified at the end of this sheet.*
Main themes :	This course aims toenable an understanding of the basic principles of fluid mechanics (kinematics; balance of mass, momentum and energy) and an understanding of the main flow regimes, that is compressible, incompressible and geophysical flows.
Aims :	a. Course contribution to the LO reference framework (programme LO) LO1: 1.1, 1.4, 1.5 LO2: 2.3, 2.4 LO3: 3.5. LO6:6.3. b. Specific formulation of programme LOs for this course At the end of this course, the student will be able: 1. Study the budget of physical quantities on material volumes or on fixed control volumes 2. To identify the appropriate mathematical models for specific flows 3. To understand the difference between physical principles and phenomenological laws 4. To solve simple fluid mechanics problems 5. To evaluate the reliability and coherence of mathematical models 6. To apply dimensional analysis 7. To design simple apparatus for heat or mass transfer 8. To estimate the drag and lift of simple objects in a flow 9. To calculate the orders of magnitude relevant to a mathematical model 10. To grasp the main processes at work in geophysical flows *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods :	Written exam with problem-based learning allowing the students to adopt a reflective approach to their learning and practices associated with it. Continuous assessment: presentation of MATLAB programmes for solving simple problems.
Teaching methods :	Lectures with mini learning activities of discovery. Exercise sessions with problems to solve. Short homework assignments where the students implement numerical solutions to simple problems in MATLAB.
Content :	Basic principles: continuum mechanics, Lagrangian and Eulerian descriptions, mass balance, momentum balance, energy and entropy balance, non-inertial reference frame, dynamic similitude. Ideal flows: dimensionless parameters, acoustic waves, compressible flows, shock waves, non-linear waves Incompressible, viscous flows: Boussinesq approximation, energy method, 1D flows, lubrication, boundary layers, introduction to turbulence. Geophysical flows: geohydrodynamic equations, dimensionless parameters, inertia oscillations, Ekman layer, geostrophic approximation, shallow water equations, Poincaré and Kelvin waves
Bibliography :	Slides, lectures notes and problems avilable on the Moodle site of the course.
Faculty or entity in charge:	PHYS

Programmes / formations proposant cette unité d'enseignement (UE)				
Intitulé du programme	Sigle	Credits	Prerequis	Acquis d'apprentissage
Minor in Physics	LPHYS100I	5	-	🔍
Bachelor in Physics	PHYS1BA	5	LPHY1211 **and** LPHY1251 **and** LPHY1261	🔍